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CHINA REPORT  
SCIENCE AND TECHNOLOGY

No. 139

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APPLIED SCIENCES

ARTICLE DESCRIBES ARTIFICIAL SATELLITE LASER RANGEFINDER

Beijing WUXIANDIAN [RADIO] in Chinese No 8, 81 p 14

[Article by Tan Detong [6223 1795 0681]: "Artificial Satellite Laser Rangefinder"]

[Tex5] Artificial satellite laser ranging is a new technique in the study of variations in the earth's self-rotation, movements of earth's poles, shape of the earth, the earth's gravitational field and continental drift. It is of significant importance in astronomical geodynamics, geodetic survey and seismic studies.

The heart of the rangefinder is a laser. It produces a sequence of extremely narrow pulsewidth high intensity laser pulses aimed at the artificial satellite in orbit through a telescope, the signals reflected from the satellite back to earth are detected by a receiving telescope. Using a high resolution counter to record the time difference  $\tau$  between the transmitted and received pulses, distance of the satellite  $R$  can be found using the formulae  $R = 1/2 c \tau$ .

A modern rangefinder is an integrated precision instrument involving optics, mechanics and electricity. It is equipped with a computer so that the entire measurement process is automated. Based on forecast of the satellite flight orbit, the computer directs the telescope to focus on the target; once the telescope has tracked the satellite, the computer then commands the transmission of the laser pulses. The measured results are first judged by the computer for authenticity and then stored in data memory. If the target is lost in the process of observation, the computer immediately conducts an automatic search scanning procedure until the rangefinder is realigned.

The cover photo shows a first generation artificial satellite laser rangefinder developed jointly by Shanghai Astronomical Observatory and Shanghai Institute of Optics and Fine Mechanics. The apparatus is installed at the Yushan Station of Shanghai Astronomical Observatory. In recent years, artificial satellite laser rangefinders have been installed in Beijing, Kunming, Zhengzhou, Xi'an, and Guangzhou to form a preliminary observation network. They are currently carrying out scientific research observations and participating in international cooperation projects and have obtained good results.

9698

CSO: 4008/15

AUTHOR: ZHU Qisheng [4376 0366 0524]

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TITLE: "Preliminary Research on the Fertility Supplying Capacity of the Soil of Huangnitian and the Effect of Fertilizer Application"

SOURCE: Huanggang HUBEI NONGYE KEXUE [HUBEI AGRICULTURAL SCIENCES] in Chinese No 10, Oct 81 pp 16-18

ABSTRACT: Huangnitu [soil of Huangnitian, a field of yellow mud] is one of the major cultivated soils in Hubei, amounting to 20 percent of cultivated area of the province, i.e. about 12,808 thousand mu. Of these, 4,360 thousand mu are paddies and 8,448 thousand mu are dry fields, amounting to 14.7 and 24.5 percent of the province's paddies and dry fields respectively. The regions of its extensive distribution are also important production bases of grain, cotton, and oil of the province. At present, the yield of Huangnitu is generally not high, with unit yield of only 300-400 jin/mu of rice, or 100-200 jin/mu of wheat, or several tens of jin/mu of ginned cotton. A study, combining small-plot field experiment and laboratory analyses, has been conducted since 1979. The test crops are dual-season rice-green manure. The field experiment is divided into 6 forms: (1) control, with no fertilizer application; (2) basic fertilizer of 2500 jin green manure/mu; (3) basic fertilizer + nitrogen, i.e. (2) + 12 jin/mu of N; (4) basic fertilizer + nitrogen-phosphorus, i.e. (3) + 6 jin of  $P_2O_5$ /mu; (5) basic fertilizer + nitrogen-potassium, i.e. (2) + 12 jin of  $K_2O$ /mu; (6) basic fertilizer + nitrogen-phosphorus-potassium, i.e. (5) + 6 jin of  $P_2O_5$ /mu. Organic matter, pH, nitrogen, phosphorus, and potas-

[continuation of HUBEI NONGYE KEXUE No 10, 1981 pp 16-18]

sium contents of Huangnitu specimens are analyzed before the experiment and after the harvest of the experimental crop every season. Rice plants are analyzed to compute the rate of absorption of nitrogen, phosphorus, potassium, and the fertilizer utilization rate. The fertilizer application benefit is further examined by combining the laboratory analysis results and growth condition and the yield of rice in the field. Results indicate that the productivity of Huangnitu is rather low and the yield of rice depends mainly on fertilizer. Utilization of chemical nitrogen is 46.1 percent for early rice and 60.6 percent for late rice. With added phosphorus, the rate is raised to 60.6 percent for early rice but only 61.3 percent for late rice. At present, potassium fertilizer has not demonstrated any yield increase results. Application of green manure appears to be the low cost and highly beneficial measure for yield increase in Huangnitu. Details of the experiment are reported.

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ZHANG, LEI of Huazhong College of Agriculture; LIAO, TAO of Hengyang Branch, Hunan  
College of Agriculture

TITLE: "Diagnosis of Rabies of Domestic Animals in Zhumadian Prefecture of Henan  
Province"

SOURCE: Huanggang HUBEI NONGYE KEXUE [HUBEI AGRICULTURAL SCIENCES] in Chinese  
No 10, Oct 81 pp 32-34

ABSTRACT: Since the autumn of 1980, cases of suspected rabies have been continuously discovered among domestic animals in Zhumadian Prefecture. In all cases, treatment produced no effect and the animals died. According to incomplete statistics of several animal hospitals, in Jan-May this year, 16 oxen, 8 sheep, 3 pigs, 1 donkey, 2 mules, and 2 dogs died of the disease in the prefecture. Epidemiological surveys, clinical symptoms, animal experimental inoculations, and laboratory examination of brain tissues all verify the diagnosis of rabies to be correct.

6248

CSO: 4009/113



Chemistry Technology

AUTHOR: PENG Shaoyi [1756 1421 6654]

ORG: Shanxi Research Institute of Coal Chemistry, Chinese Academy of Sciences

TITLE: "Progress of Research on Fibrous Materials as Catalyst Carrier"

SOURCE: Taiyuan RANLIAO HUAXUE XUEBAO [JOURNAL OF FUEL CHEMISTRY AND TECHNOLOGY]  
in Chinese Vol 9 No 3, Sep 81 pp 193-205

ABSTRACT: More than 80 percent of work processes in petroleum, natural gas, and petroleum refining industries are related to catalysis and the conversion of coal energy and the utilization of solar energy are also dependent on catalytic reactions. Inorganic fibers, including carbon, glass, and aluminum oxide fibers, having a different surface structure and transfer characteristics, are among the newly developed catalytic carriers. Their greater surface area and much smaller pore diameter, relative to ordinary granular carriers, are favorable for diffusion control and fast surface reaction. Techniques of preparing and applying fibrous catalytic agents are introduced. Results of experiments, including those in related Western and Chinese literatures and experiments conducted by the author and colleagues, have proved these properties to be superior. Many basic problems, such as possible effects of their chemical composition and their micropores on the catalytic reaction, will require a great deal of research in the future, however.

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TITLE: "Study of Natural Mordenite Catalyst for Disproportionation of Toluene"

SOURCE: Taiyuan RANLIAO HUAXUE XUEBAO [JOURNAL OF FUEL CHEMISTRY AND TECHNOLOGY]  
in Chinese Vol 9 No 3, Sep 81 pp 206-215

ABSTRACT: This paper reports a study on the use of natural mordenite produced in Jinyun County of Zhejiang Province to prepare a catalyst for disproportionating toluene. Results indicate that the size of grain of the mordenite, the metallic element of the additive, and the method of preparation all have obvious effects on the stability of the disproportionating activity of the catalyst. The disproportionating property of the catalyst prepared with the natural mordenite with nickel and bismuth added is found to reach the level of that of synthetic mordenite catalyst.

6248

CSO: 4009/97



Construction Machinery

AUTHOR: ZHANG Jizhen [1728 7162 3791]

ORG: None

TITLE: "The DZ1 Hole Drilling Vehicle"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 10, 20 Oct 81 pp 4-7

ABSTRACT: The DZ1 hole drilling vehicle is a special machine used for constructing electrified railways. It is an experimental design made jointly by Baoji Construction Machinery Plant of the Ministry of Railways and the Bureau of Electrification Construction. Its properties were tested in 1980 on the special railway line of the plant and on the Longhai Railroad. The machine is used to drill holes for power line poles. Mechanical transmission is used for motion and hydraulic transmission is used for operation. Its major technical parameters and the structural theories of its various components are explained. There is a photo depicting the hole drilling vehicle at work along the Longhai Railroad.

AUTHOR: GONG Bin [7895 2430]

ORG: Technology Division, Wuhan Truck Crane Plant

TITLE: "The YD5 Hydraulic Truck Crane"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 10, 20 Oct 81 pp 8-9

ABSTRACT: The YD5 hydraulic truck crane is designed by the Wuhan Truck Crane Plant as an economical equipment for both hoisting and transportation. The major technical parameters and structural characteristics are explained. It is suggested that under the condition of guaranteeing the hoisting capacity, the size and the weight of the entire system may be somewhat reduced, the CM-F40C-FL gear motor used in the truck has a relatively short useful life and a new one should be selected, and the oil tube of the hydraulic system is difficult to put together or take apart. There is no indication whether it is the author or some other organization who are making these suggestions. A photo of the YD5 hydraulic truck crane is included.

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TITLE: "The JZ190 Conical Reverser"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 10, 20 Oct 81 pp 9-10

ABSTRACT: The JZ190 conical reverser is a new product of the Xiangshan Shipbuilding Plant. It is used for drilling fluid or semi-dry concrete. When the material is hard, the machine is operated in the dry mode. The major property parameters are explained. There are photos depicting the machine and the water meter control valve.

AUTHOR: LIN Shuqin [2651 2885 06]  
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TITLE: "The ZL20A and ZL30A Loaders"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 10, 20 Oct 81 pp 10-12

ABSTRACT: On the foundation of the construction machinery plant has been produced opinions of the users and advanced models. Very strict tests were carried out on these models. Finally, the ZL20A and the ZL30A loaders were selected. Their technical parameters, strength, property parameters, stress, maintenance and repair, the new models. The structures of major parts and two previous papers (GONGCHENG JIXIE) are explained. There is, however, a table comparing the new models and the two old models.

6168  
CSO: 4009/115

## Construction Machinery

AUTHOR: WANG Mingquan [3769 0730 5425]  
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TITLE: "Internal Combustion Trackless Tractor for Use in Mine Pits"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 9, 20 Sep 81 pp 1-5

ABSTRACT: In order to make trackless mines a reality in China, the institute and the plant jointly made 3-types of 2-way drive internal combustion tractors: QCZ-90, QCC-90, QCZ-60. Prototypes of all 3 models have completed industrial tests in mines and have proved to be suitable for the adverse environment of the pits. The low-polluting diesel engine, the external purification device, the tractor frame, the transmission system, the steering and power output devices, and the brake system are described. A photo of the QCZ-90 model tractor is included.

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ORG: SHEN of Xian College of Metallurgy and Construction; LIU, WANG of Bureau of Construction No 1, Ministry of Railways

TITLE: "Several Viewpoints Concerning the Establishment of A Repair Center of Construction Machines"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 9, 20 Sep 81 pp 26-29

ABSTRACT: In the current process of adjusting and reforming the economic system, many have advocated the principle of specialization and cooperation and in the machine manufacturing industry, specialized centers for heat treatment, welding, casting, electroplating, etc. have been established and obvious economic and technological advantages have been demonstrated. In the industry of construction machinery repair, problems of repetitious plant, equipment, and personnel, high cost, poor quality, and long repair time, shortage of parts, etc. do exist. Some believe a repair center should be established. Others maintain that as work sites are often in remote areas, a repair center will require machines to be transported over a long distance. The authors propose a method of establishing a repair center to coordinate various local plants to distribute the jobs of major and minor repairs and to resolve problems of buying, manufacturing, repair, storing, and supplying parts.

AUTHOR: YI Xinqian [2496 2450 0051]

ORG: None

TITLE: "Some Suggestions Concerning Reorganizing the Construction Machinery Repair Industry in China"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 9, 20 Sep 81 pp 29-33

ABSTRACT: In foreign countries, machinery repair may take the following forms: (1) Machines are repaired by the manufacturers; (2) The manufacturer produces a large number of parts for the users to repair the machines or for the repairman to bring the parts to the users for repair; (3) Establishing large specialized repair plants. The USA, England, Czechoslovakia, etc. adopt mostly the first two methods; the last method is most popular in the USSR. In China, specialized machine repair plants have been the system for many years. For example, the Construction Machinery Repair Plant No 2 of the Ministry of Railways is located in Chengdu, Sichuan Province. In 1977, of the 122 construction machines repaired at the plant, only 17 were from within the province. The remaining 105 machines were transported 1000-3000 km to the plant for repair. The author suggests a reorganization of the system having a centralized leadership, local specialized major repair centers, and basic level parts production and repair organizations. In the future, it may be more reasonable to regard machinery repair as one system without having to have a separate system of construction machinery repair.

6168

CSU: 4009/99

AUTHOR: LU Zhongzuo [7120 6945 4373]

ORG: Nanjing Institute of Technology

TITLE: "The Filter Properties and Theoretical Analysis of the Axial Conductor Loaded Helix"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 1-10

TEXT OF ENGLISH ABSTRACT: This paper presents a new problem with the filter properties of the axial conductor loaded helix. By using the equivalent transmission network analysis, it is shown that the filter properties are different from those of the structures as suggested in narrow band TWT. In this kind of structure, the TWT can be constructed not only in narrow band operation, but also in super-wide band operation.

The theoretical analysis of the axial conductor loaded helix shows that its transverse impedance can be loaded low enough, even to 50 ohms, and easily matched to the external coaxial coupler directly, while at the same time it maintains the coupling impedance at rather higher values and obtains high gain in TWT.

One of the distinguishing advantages of the filter type slow wave circuit used in TWT is its property of suppressing the BWO. The axial conductor loaded helix also

[Continuation of DIANZI XUEBAO No 5, 1981 pp 1-10]

has this kind of property. Dr Otto Sauseng of the United States adopted this kind of slow wave circuit in his TWT in 1970 and no BWO occurred, but he gave no explanation. Actually, as is shown in this paper, the suppression of BWO is due to the filter property of the structure. The TWT, when using this kind of structure, shows that the operation is quite stable.

The theoretical calculation method of the axial conductor loaded helix as used in the United States is S.F. Paik's method, while in the USSR N.I. Kravolenko's method is used. However, these two methods mainly give out the dispersion relations, do not point out filter properties, and do not reveal such characteristics as the pass-band, stop band, suppression of BWO, effect of the metallic conductor numbers, the effect of the dimensions of the metallic conductor and the effect of the position of the coaxial coupler. In this paper, all these problems are analyzed and relations are given. In addition, the cold circuit experiment has been performed and the dispersion curve obtained is shown more closely in this method than in Paik's method. Also, the match of the input coupler in the super-wide band is quite good. Therefore, this filter analyzing method can be used to design the loaded helix for super-wide band TWT.

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TITLE: "Index Mappings for Multidimensional DFT from One-dimensional DFT"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 11-21

TEXT OF ENGLISH ABSTRACT: The mappings from one-dimensional data series into multidimensional array, in which the lengths of every pair of dimensions are relatively prime, are the basis of the Winograd Fourier Transform Algorithm (WFTA). This paper presents a general formulation of index mappings for L-dimensional DFT from one-dimensional DFT and shows that the possible number of these mappings is  $L! \prod_{i=1}^L \phi(N_i)$ , where  $\phi(\cdot)$  is the Euler function, as for each mapping the transform formulations are given. An example shows that there are several particular mappings whose input and output index mappings are identical when  $N = 4 \cdot 5 = 20$ .

Some doubts have been raised about the results obtained by Kolba, Parks and Winograd in discussing the special case  $L=2$ . In section V of Kolba and Parks' article, the expressions  $r_1 = M_2 \pmod{M_1}$ ,  $r_2 = M_1 \pmod{M_2}$  should be written as  $r_1 M_2 = 1 \pmod{M_1}$ ,  $r_2 M_1 = 1 \pmod{M_2}$ . In section IV of Winograd's article, formulations for

[Continuation of DIANZI XUEBAO No 5, 1981 pp 11-21]

the index mapping  $b_{j_1 n_2 + j_2} = a_{r_1 j_1 n_1 + r_2 j_2 n_2} \pmod{n}$  and  $B_{k_1 n_2 + k_2} = A_{s_1 k_1 n_1 + s_2 k_2 n_2} \pmod{n}$  should be replaced by either  $b_{j_1 n_2 + j_2} = a_{r_2 j_1 n_2 + r_1 j_2 n_1} \pmod{n}$  and  $B_{k_1 n_2 + k_2} = A_{s_2 k_1 n_2 + s_1 k_2 n_1} \pmod{n}$  or  $b_{j_1 n_1 + j_2} = a_{r_1 j_1 n_1 + r_1 j_2 n_1} \pmod{n}$  and  $B_{k_1 n_1 + k_2} = A_{s_1 k_1 n_1 + s_2 k_2 n_2} \pmod{n}$ .

At the 1979 IEEE International Conference on ASSP, the paper by Ellioff and Orton presented the same view as this article, discussing the case of general L, however, and the formulations of index mappings were only meant for two particular cases of

$L! \prod_{i=1}^L \phi(N_i)$ .



AUTHOR: LIU Xing [0491 5281]

ORG: Nanjing Electronic Engineering Institute

TITLE: "Optimal Estimations and Error Analysis of Polynomial Differential"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 22-31

TEXT OF ENGLISH ABSTRACT: This paper discusses the improved least square method for polynomial differentiation. The method is suitable for real-time data processing and real-time control by a computer. It covers optimal estimations of both momentary value and continuous function curve of polynomial differential. Smoothing time may be taken at the sampling time or between any two neighboring samples. For middle-point smoothing, the number of samples may be odd or even. Simple formulas of weight coefficients and estimation errors are also shown in the paper. The law of error changes is easily shown by formulas of estimation errors, which is very useful for the correct use of the least square method.

AUTHOR: LIU Luqin [0491 7627 0530]

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TITLE: "Tracking Doppler Frequency and Its Changing Rate by means of DFT"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 32-38

TEXT OF ENGLISH ABSTRACT: It is often troublesome, or even difficult, for the narrow band system in a coherent-pulse instrumentation radar to precisely track the radial speed of the target under conditions of low pulse repetition frequency of the radar and high speed and acceleration of the target.

A method is presented in this paper to bring about an all digital tracking system based on modified DFT. Such a system can track not only the radial speed of the target, but also its acceleration directly in conditions of low repetition frequency and high target speed and acceleration.

The first part of the paper describes the influence of target radial acceleration on DFT, the modified DFT which can eliminate the said influence, and the two-dimensional response characteristics of the frequency and the frequency changing rate of this modified DFT. The second part explains the method of eliminating speed ambiguity by repetition frequency agility. This method is based on solving

[Continuation of DIANZI XUEBAO No 5, 1981 pp 32-38]

residual equations for root and does not depend on target range information. The third part deals with the narrow band tracking loop based on modified DFT. Two-dimensional error characteristics of the frequency and the frequency changing rate are presented, and a block-diagram of the system is also given.

The author has conducted mathematical simulation of the above system. The results show that the accuracy in the measurement of radial speed and acceleration is quite satisfactory under the condition of comparatively low signal-noise ratio.

AUTHOR: ZHAO Luguang [6392 7627 0342]

ORG: Changchun Institute of Physics, Chinese Academy of Sciences

TITLE: "Effect of Junction Capacitance and Spontaneous Recombination on Time Delay of Turn-on of Injection Lasers Modulated by Pulse Currents"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 39-47

TEXT OF ENGLISH ABSTRACT: In this paper the effect of junction capacitance, spontaneous recombination, DC-bias and injected pulse current on time delay of turn-on of injection lasers modulated by pulse currents is analyzed comprehensively. Kinetic equations considering those factors are developed. A variety of possible cases for are discussed, and results for some typical parameters are given. The calculated results are found to coincide with the measured values. When the junction capacitance is not very small ( $>20$  pF), it is an important factor for the time delay just like spontaneous recombination. The reduction of the time delay by DC-bias is not linear, becoming small gradually from zero-bias to DC-bias at threshold. Thus we can obtain the best modulation by DC-bias below threshold.



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ORG: Department of Automation Engineering, Shanghai Institute of Mechanical Engineering

TITLE: "A Topological Technique for the Sensitivity Calculation"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 48-56

TEXT OF ENGLISH ABSTRACT: This paper presents a topological technique for sensitivity calculation by means of the signal flow graphs theory. In our signal flow graph, the branch gains for the input branches and the intermediate branches are the nonlinear function of the system parameter for finding the sensitivity. According to the definition of summing matrix and branching matrix, and by using Tellegen's theorem for signal flow graph, the general expression has been developed. The key to this technique is calculating the sensitivity by direct application of the topological structure of the signal flow graph. The existing results may be considered as special cases of the general expression proposed in this paper. Finally, the application of the expression is illustrated by a concrete example.

AUTHOR: GUO Yanying [6753 5888 3853]

ORG: 23rd Institute, 7th Ministry of Machine Building

TITLE: "Theoretical Analysis of the Microwave Impulse Governed Oscillator"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 57-63

TEXT OF ENGLISH ABSTRACT: Many previous articles considered the operating frequency of an impulse governed oscillator (IGO) difficult to be extended to the microwave band. One of the reasons put forward was that the width of the synchronizing pulse must be narrower than one-fifth to one-third of the period of the VCO, which is relatively difficult to achieve in the microwave band. Some recent literature raised an objection to this, but still considered the narrower the synchronizing pulse for a microwave IGO in the case of non-ideal sample-and-hold, the better. This paper proves that neither of these conclusions is exactly true. In addition, previous articles also doubted the loop stability of IGO, and held that its phase noise might be greater than that of a common phase lock loop. This paper discusses the problems concerning phase noise and loop stability. Theoretical analysis and an IGO experiment at 3 GHz show that a correctly designed microwave IGO has low phase noise, better stability and a simpler, compact strip-line structure. Therefore, further advances of the IGO may be expected.

AUTHOR: SHE Xianye [0152 7359 8768]

ORG: Nanjing Electronic Technology Institute

TITLE: "A YIG Single Crystal Sphere in the Center of the Looped Current"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 64-69

TEXT OF ENGLISH ABSTRACT: With electromagnetic field theory, formation of the impedance of a YIG single crystal sphere resonator coupled by a loop is analyzed in this paper. When the diameter of a single crystal sphere can be compared with the diameter of a loop, a general formula of resonator impedance is derived.

Considering that the surface of the magnetic pole is an ideal magnetic wall, by means of the mirror method the effect of outer magnetic pole on resonator impedance is analyzed quantitatively. The resonator impedance formula derived by the author differs from those by Comstock and Hellszajn slightly and proves that the impedance formulas given by Carter and Igarashi are only suitable for the case of the radius of the single crystal sphere being much less than that of a loop.

AUTHOR: LIN Shaochi [2651 4801 1015]  
BAO Zhixiang [0545 2535 7449]  
GONG Guangyuan [7895 0342 3293]  
HUO Yunsheng [7202 5366 3932]  
et al.

ORG: LIN of the University of California, San Diego; BAO, GONG and HUO, et al, all of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Study of X-ray Preionized Electron Avalanche Discharge Laser at High Gas Pressures"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 70-74

TEXT OF ENGLISH ABSTRACT: Some experimental results of an X-ray preionized homogeneous discharge laser at high gas pressures are presented. In this device a multi-arc-channel rail gap switch is used to create a fast voltage rise time, and a water-dielectric transmission line is employed as the discharge energy source. Homogeneous discharge lasts about 70 ns in a typical XeCl\* gas mixture of 2~5 atm, and a laser output energy higher than 1.2 joules has been obtained in an active volume of  $2.0 \times 1.5 \times 70 \text{ cm}^3$ .

AUTHOR: LEI Shizhan [7191 0099 3277]

ORG: Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Pulse-width of Excimer Laser"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 75-78

TEXT OF ENGLISH ABSTRACT: Based on the laser oscillation requirements, this paper discusses the condition for increasing pulse-width of excimer laser. In principle, CW operation of excimer laser can be obtained. For example, if dc discharge current density  $J > 5 \text{ A/cm}^2$ , the XeF\* excimer laser can produce CW output. But, under this discharge level, arc discharge is likely to occur and, as a result of arc discharge, laser oscillation will be interrupted. The problem may be solved if an electron beam source is used. However, it is rather difficult now to make a high power electron beam source.

AUTHOR: LI Jingzhang [2621 2417 4545]

ORG: Hubei Institute of Computing Technology, Beijing

TITLE: "Theory of Crosstalk Between Lines"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 79-85

TEXT OF ENGLISH ABSTRACT: A further theoretical analysis of crosstalk between two lines is given. This paper presents the theoretical formulas for calculation of wave for crosstalk between two lines with arbitrary input signal function and arbitrary termination impedance. The practical applications are illustrated by an example.

AUTHOR: CAI Jianming [5591 0494 6900]  
WANG Shilin [3769 1102 2651]  
GUAN Zhaohua [7070 5128 5478]  
CHEN Yuansheng [7115 0337 3932]  
CHEN Yujing [7115 3558 2529]

ORG: All of the Institute of Communication Engineering, Nanjing

TITLE: "Digital Processing of the TV Sync and Sound Signal"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 86-90

TEXT OF ENGLISH ABSTRACT: "Gray Scale Sync" is a new technology which can not only implement the "Sound-in-Sync" technique effectively, but also improve the signal to noise ratio of the TV picture by 3 dB. Based on the study of the digital processing of the TV sync and sound signals, we have developed "Gray Scale Sync" equipment capable of handling the PAL format composite color TV signals and also suitable for the reception of overdeviation signals. In this treatise, stress is laid on the explanation of the scheme and the results of the experiments.

AUTHOR: XIAO Dachuan [5135 6671 1557]

ORG: Department of Electrical Engineering, Qinghua University

TITLE: "Alternative Proof of the Existence and Uniqueness Theorems for Nonlinear Resistive Circuit"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 91-94

TEXT OF ENGLISH ABSTRACT: Alternative proofs of two theorems concerning the existence and uniqueness of solutions for nonlinear resistive circuit are given. The colored branch theorem is used to facilitate the test of the condition which must be satisfied by norms.

AUTHOR: LE Weida [2867 0251 6671]

ORG: Shanghai Institute of Metrological Technology

TITLE: "A New Microwave Phase Standard Calibration System"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 95-97

TEXT OF ENGLISH ABSTRACT: This paper describes a new scheme and an experimental system to realize high precision microwave phase calibration by directly heterodyning microwave to low frequency and using a low frequency inductive phase shifter as a standard reference. The accuracy obtained is 0.1 at 5 cm band, and can be increased to  $\pm 0.02$  using the author's frequency-division method. Some ideas are given for error checking and self-calibration techniques.

AUTHOR: MEI Qizhi [2734 0796 2535]

ORG: Qinghua University, Beijing

TITLE: "Concepts of the Fault Tree's Dual Tree and Success Tree"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 98-99, 104

TEXT OF ENGLISH ABSTRACT: This paper discusses the concepts of the fault tree's dual tree and success tree as follows: 1) The dual tree and the success tree are two different concepts. 2) If the fault tree's mathematical expression is  $\varphi(X)$ , then its dual tree's mathematical expression will be defined as  $\varphi^D(X) = 1 - \varphi(1-X)$ , the relationship between the fault tree and its dual tree being that their "gates" are different, "AND"  $\leftrightarrow$  "OR," and their "bottom events" are completely identical. At the same time, the cut set of the dual tree is the path set of the fault tree and vice versa. 3) The success tree's mathematical expression is  $\overline{\varphi(X)} = 1 - \varphi(X)$ , the relationship between the fault tree and its success tree being that their "gates" are different, "AND"  $\leftrightarrow$  "OR," and their "bottom events" are also different and complementary. Strictly speaking, the cut set of the success tree is not the path set of the fault tree and vice versa.

AUTHOR: GU Weijun [7357 1983 0689]  
SHAN Guangzhi [0830 1639 2535]

ORG: Both of Tianjin No 1 Radio Equipment Factory

TITLE: "Dual-ramp A/D Converter Error Due to Dielectric Absorption of the Integrator Capacitor"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981  
pp 100-104

TEXT OF ENGLISH ABSTRACT: This paper analyzes the dual-ramp A to D converter error due to dielectric absorption of the integrator capacitor with a rigorous mathematical method. It is proved that if the dual-ramp A to D converter runs continuously and if the same voltage has been measured for a sufficiently long time, the dielectric absorption of the integrator capacitor will not cause any error. When measured voltage changes abruptly the dielectric absorption of the capacitor will cause error for the first few measurements. The formula for calculating error and its time constant is obtained.

9717  
CSO: 4009/80

AUTHOR: YU Shiwen [0205 1102 3090]

ORG: Beijing University

TITLE: "Large Scale Software System Used in Chinese Language Editing and Typesetting"

SOURCE: Beijing DIANZI KEXUE JISHU [SCIENCE AND TECHNOLOGY OF ELECTRONICS] in Chinese No 10, 10 Oct 81 pp 2-4

ABSTRACT: A computer-laser Chinese Han character editing and composing system has been designed for the purpose of realizing automation of typesetting work of Chinese language books and newspapers. An information contraction technique is adopted to reduce the quantity of data to 1/500 so that a magnetic disk of a capacity of 5 billion bytes is sufficient to hold all the character data and after processing, the phototypesetting control computer can restore the contracted data into a dot matrix. The roller output is by the line with a scanning density of 29.2 lines/mm. The software is a part of the basic structure. Its testing began in the middle of 1979 and was completed toward the end of 1980. This paper describes the software, after a brief introduction of the hardware system. This paper is a selection from the Collection of Data of Beijing District Software Engineering Symposium, Mar 81.

AUTHOR: HE MI [0149 1348]

ORG: None

TITLE: "Certification of Stereo-X-Ray Television"

SOURCE: Beijing DIANZI KEXUE JISHU [SCIENCE AND TECHNOLOGY OF ELECTRONICS] in Chinese No 10, 10 Oct 81 p 45

ABSTRACT: The Hangzhou University, the Ningbo Research Institute of Stereoscopic Television, and the Hangzhou Hospital No 1 carried out joint research to produce the stereo-x-ray television. In the research process, 3 schemes were successfully created, including the 2-camera mechanical synchronization scheme, the 2-camera electronic synchronization scheme, and the single camera electronic synchronization scheme. The last scheme was presented for certification on 20 Jun 81. This scheme is based upon the theory of parallax of the two eyes. Using two grid control x-ray tubes and one camera, stereo-x-ray images are successfully obtained. With the new grid control x-ray emission technique, the x-ray radiation dosage is obviously reduced. Test applications of more than a year have demonstrated that the design is correct, reasonable, and advanced, and the images are lifelike, clear, and very 3-dimensional looking. Clinical tests in more than 200 cases indicate that the machine does have important value in medical diagnosis, but its screen (9-inch) is not big enough and there is a low frequency scintillation phenomenon in the background of the images. The paper gives no indication of whether the machine is approved or disapproved.

6248

CSO: 4009/103



## Engineering

AUTHOR: WU Boxiu [0702 0130 0208]  
ZHUANG Kunjie [5445 2492 2638]  
LIN Fuhua [2651 4395 5478]  
HE Liquan [0149 4539 2938]

ORG: All of Nanjing Institute of Technology

TITLE: "An Experimental Modulized Communication System Using MIC"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 1-7

TEXT OF ENGLISH ABSTRACT: This paper reviews the development of a 1 GHz communication relay system by using a combination of lumped microfilm technique and distributed microstrip technique. All the channel equipment of this system are composed of a combination of 8 kinds of universal and special modules, which are in turn composed of 11 kinds of universal and special chipped circuits. Hence the equipment has the advantages of small size, light weight, good exchangeability, easy repairing and small power consumption.

This paper gives the main specifications and block diagrams of the equipment, illustrating how different equipment of the system can be assembled from the modules.

AUTHOR: ZHUANG Kunjie [5445 2492 2638]  
LIN Fuhua [2651 4395 5478]

ORG: Both of Nanjing Institute of Technology

TITLE: "An Experimental 1 GHz Integrated Transmitter"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 8-17

TEXT OF ENGLISH ABSTRACT: This paper presents the principles and characteristics of the following modules: power amplifier, phase modulator and up converter, which are used in the transmitter of the 1 GHz microwave relay system. These modules are assembled with some universal and special chipped hybrid integrated circuits, made by using microfilm technique. The characteristics of the automatic level control loop in the power amplifier are analyzed, and experimental results are also given.

AUTHOR: ZHUANG Kunjie [5445 2492 2638]  
HE Liquan [0149 4539 2938]

ORG: Both of Nanjing Institute of Technology

TITLE: "An Experimental 1 GHz Integrated Receiver"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 18-23

TEXT OF ENGLISH ABSTRACT: This paper presents the block diagram and its chipped circuits of an experimental microwave integrated receiver. It discusses the technique of the balanced circuits which is widely used in the receiver.

The experimental receiver has been used in a microwave relay system for TV transmission and digital communication, with satisfactory performances.

AUTHOR: WU Boxiu [0702 0130 0208]

ORG: Nanjing Institute of Technology

TITLE: "A Duplexer with Directional Filter Used in 1 GHz Communication System: Analysis of Its Properties and Determination of Its Specifications"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 24-37

TEXT OF ENGLISH ABSTRACT: This paper presents the principle and characteristics of a duplexer with directional filter used in 1 GHz modulated communication system using MIC. A power spectrum equation of a double-polarity multiplex  $\Delta M$  PSK signal transmitted in this system is derived. Based on this equation, this paper gives a method for determining the main specifications of this kind of duplexer with the aid of the TI 59 programmable calculator. Finally the structure diagram and selectivity curve of an experimental duplexer which was designed and developed according to those specifications are given.

AUTHOR: ZHOU Shougen [0719 1108 2704]  
SUN Minsong [1327 2404 2646]

ORG: Both of Nanjing Institute of Technology

TITLE: "A 21 cm Feedback Radiometer of All Solid State"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 38-44

TEXT OF ENGLISH ABSTRACT: A microwave feedback radiometer used for research on microwave characteristics of various materials is discussed in this paper. The receiver circuit and components which are easily influenced by drift are connected to a feedback network in order to eliminate the effect of the change of gain. Thus the stability of the radiometer is improved.

The principle and design of the system are analyzed; microwave integrated circuits are described. A calibration curve and experimental data are given in the paper.

Output noise fluctuation (rms) of the equipment is  $0.35^{\circ}\text{K} \pm 0.1^{\circ}\text{K}$ .

AUTHOR: WANG Anhua [3769 1344 5478]  
QIAN Linjun [6929 7207 0689]

ORG: Both of Nanjing Institute of Technology

TITLE: "Synthesis of the Logical Networks at Remote Controlled Terminals"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 45-52

TEXT OF ENGLISH ABSTRACT: This paper presents a new scheme of encoding and decoding of constant ratio code by the minimization principle of combinational logical networks. It simplifies and improves the terminal scheme of the existing radio remote controller and makes the remote controller for a group of machines realizable on the building-block principle.

AUTHOR: SONG Wenzhong [1345 2429 1813]  
XU Sixin [1776 0843 9515]

ORG: Both of Nanjing Institute of Technology

TITLE: "Software for COR-LS Identification"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 53-64

TEXT OF ENGLISH ABSTRACT: This software can be used to process data in identification experiments for open- or closed-loop systems to give an estimate of system parameters using the correlation, least squares or correlation-least squares method. It also includes an automatic searching program for the order and time delay of the model.

The software is programmed in ALGOL-60. It is used to process a series of experimental data to establish the dynamic model of a boiler in a power plant.

AUTHOR: QIAN Weimin [6929 3634 3046]  
YE Bingsheng [5509 3521 3932]  
LIN Jiqun [2651 3444 5028]

ORG: All of Nanjing Institute of Technology

TITLE: "Generating System for Package of User's Programs of Process Control Computers"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 65-70

TEXT OF ENGLISH ABSTRACT: A package of user's programs for process-control computers, model PCP-131-1, was verified in December, 1980. In order to extend its application, to develop new systems and to suit the different requirements of various users, we have designed a generating system. A simulation test has proved the generating system to be effective after debugging.

This article deals mainly with the principles and methods used in designing the system and the important technical measures taken. The system is suitable for model DJS-100 and other compatible computers.

AUTHOR: CAO Shu [2580 1859]

ORG: Nanjing Institute of Technology

TITLE: "Strength Function of Bulk Polariton in Antiferromagnet with Externally Applied Magnetic Field"

SOURCE: Nanjing NANJING CONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 71-78

TEXT OF ENGLISH ABSTRACT: When an electromagnetic wave propagates in an antiferromagnet, it will interact with the magnons of the antiferromagnet and form bulk magnetic polariton in the antiferromagnet. The energy associated with the polariton consists of two parts: One portion is the energy associated with the electromagnetic field and the other portion is the energy associated with the excited magnons. With the help of the theory of electromagnetic field and the torque equations of antiferromagnets, the relation between energy density and frequency has been studied and the strength functions of bulk polariton in the Voigt configuration are presented.

AUTHOR: WANG Peilun [3769 0160 4858]

ORG: Nanjing Institute of Technology

TITLE: "Bending of a Bar with an Isosceles Triangular Cross Section"

SOURCE: Nanjing NANJING CONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 79-84

TEXT OF ENGLISH ABSTRACT: Because of the difficult mathematics involved, an exact solution for the problem of isosceles triangular bars in bending has been carried out only in specific cases. The stress function to be presented in this paper is applicable for all values of  $2\alpha$  between 0 deg and 90 deg. Timoshenko's stress function and solution may be viewed as a special case of this general stress function and solution.

AUTHOR: DAI Decheng [2071 1795 2052]

ORG: Nanjing Institute of Technology

TITLE: "Nonlinear Nonholonomous Constraints in Analytical Mechanics"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 85-92

TEXT OF ENGLISH ABSTRACT: In this paper the definition of virtual displacement, Chetaev's definition, commutative law of operators and the equation of motion in nonlinear nonholonomous systems are discussed.

AUTHOR: LU Zhitao [0712 1807 3447]

ORG: Nanjing Institute of Technology

TITLE: "Calculation of Normal Section Strength of Reinforced Concrete Members Subjected to Biaxial Bending"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 93-100

TEXT OF ENGLISH ABSTRACT: This paper reviews the existing method for calculating normal section strength of reinforced concrete members subjected to biaxial bending. Based on the tests carried out in our institute, a new method of calculation and new formulas are proposed.

The proposed method has been verified by test results obtained from investigators at home and abroad. Comparison shows that the proposed method is clearer in conception and more accurate than the method given in the current Design Code (TJ 10-74).

AUTHOR: CHENG Wenrang [4453 2429 3475]

ORG: Nanjing Institute of Technology

TITLE: "An Experimental Study on the Cracking Strength, Stiffness and Crack Width of Reinforced Concrete Members with Rectangular Section Subjected to Eccentric Tension"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 101-116

TEXT OF ENGLISH ABSTRACT: Based on the theoretical analysis and test results, this paper presents a series of new formulas for calculating cracking strength, stiffness and crack width of reinforced concrete members with rectangular cross section subjected to eccentric loads. The formulas are compatible with those for the two extreme cases of the axial tension members and the pure flexure members, and are very convenient for use in practical design computations.

AUTHOR: YUAN Biguo [5913 1801 2654]

ORG: Nanjing Institute of Technology

TITLE: "An Experimental Study of Plastic Hinges for Reinforced Concrete Members Subjected to Bending and Axial Load"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 117-129

TEXT OF ENGLISH ABSTRACT: This paper presents some test results of reinforced concrete members subjected to bending and axial load. The measured data, including the formation of plastic hinges, the actual length of plastic regions, the distributions of curvature and the rotation capacity of plastic hinges, are analyzed. Some formulas of calculation are proposed based on the results of analysis. Measured data, including deflections and ductilities of specimens, are listed in this paper also.

9717

CSO: 4009/73



AUTHOR: LAI Zuhan [6351 4371 3211]  
CHEN Longjiang [7115 7127 3068]  
ZHANG Jiamin [1728 0857 2404]  
et al.

ORG: All of the Physics of Metals Teaching and Research Group

TITLE: "The Determination of Crack Initiation in TPB Specimens of Medium-high Strength Steel by means of Computer"

SOURCE Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 1-12

TEXT OF ENGLISH ABSTRACT: An analytical method for determining the initiation of crack growth in TPB specimens is developed. Several kinds of medium-high strength steel with yield strength in the range of 53-115 kg/mm<sup>2</sup> are used to test the method. It is satisfactory in  $J_{Ic}$  determination of a single specimen when it is compared with the usual multi-specimen method.

The dimensions of the specimens are  $B \times W \times L = 20 \times 24 \times 110$  mm, where  $B$ ,  $W$ ,  $L$  are respectively the thickness, width and length of the specimen. With such size limitation, it is found that the steel investigated falls into different types. It is important to distinguish the plastic behavior at the crack tip before the

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 1-12]

initiation of crack growth. The analytical method developed in this paper takes into account the possible change of work hardening capacity at the crack tip region.

AUTHOR: GUAN Yingnan [7070 4481 3948]

ORG: First Teaching and Research Group, Department of Mathematics

TITLE: "A Computing Method of the Number of Lateral Sides and the Coordinates of Vertices of a Mixture Convex-polyhedron Having Lower and Upper Bounds"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 13-22

TEXT OF ENGLISH ABSTRACT: A mixture problem having lower and upper bounds is expressed as

(1)

Its interest region is an irregular convex-polyhedron in  $(n-1)$  dimension space. By use of the pseudo-component transform

$$z_i = (x_i - a_i)/R \quad (i = 1, 2, \dots, n) \quad (2)$$

the expression (1) can be reduced to a mixture problem having upper bound only, i.e.

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 13-22]

where

(3)

In this paper, a computing procedure applying  $(b_1'', b_2'', \dots, b_n'')$  to the direct construction of coordinates of vertices in expression (1) is given. It is a simplified method in comparison with the conventional computing method. At the same time a formula

$$L = n - u + w \quad (4)$$

is given to directly compute the number of  $(n-2)$  dimensional lateral sides of a  $(n-1)$  dimensional convex-polyhedron, where

$L$ --number of  $(n-2)$  dimensional lateral sides;

$u$ --number of  $b_i''$  ( $i = 1, 2, \dots, n$ ), equal to 1;

$w$ --number of vertices of the reversely placed simples

(5)

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 13-22]

such a simplex lying outside the normal simplex

(6)

AUTHOR: GUO Bwei [6753 0130 0251]  
XUE Jiaqing [5641 0857 1987]  
YANG Zekuan [2799 3419 1401]

ORG: GUO and YANG of the Department of Heat Engineering; XUE of the Department of Mathematics

TITLE: "A Group of Governing Equations and Their Solutions for Determining Theoretical Flame Temperature"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 23-31

TEXT OF ENGLISH ABSTRACT: Theoretical flame temperature is a thermodynamic quantity of importance in many combustion problems and is also an important parameter for some thermotechnical calculations. A group of nonlinear equations, which may be considered governing equations solvable to theoretical flame temperature, is presented in this paper, with such equations considered bases for conservation of matter under chemical reaction, chemical equilibrium and enthalpy conservation. In order for such a group of equations to be solved conveniently, some parameters involved and related to the unknown value to be solved, i.e., theoretical flame temperature, are taken in the form of tabular data. For this reason, the methods usually used for solving nonlinear equations, e.g., Newton-Raphson's method, are inapplicable. The existence of the unique solution for  $\psi_2(v, t) = 0$  having been

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 23-31]

proved, the equations presented in the paper can then be solved by a computer with the introduction of bi-dichotomy (applied first to the above-mentioned equation, and then to  $f(u,v,t) = 0$  respectively). Thus, a method for determining theoretical flame temperature is provided with precision and simplicity. A source program for computing theoretical flame temperature and composition of combustion products of industrial fuel is made. Finally, a practical example of computing natural gas is given.

AUTHOR: NING Baolin [1380 1405 2651]  
SHANG Deyi [1424 1795 5030]

ORG: Both of the Smelting Furnace Teaching and Research Group

TITLE: "A Study of One-way Direct Exchange Area Due to Radiant Heat Transfer in an Enclosed System"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 33-44

TEXT OF ENGLISH ABSTRACT: The predictive calculations of the distribution of temperature and heat flux in a reheating furnace may represent the most important prediction of industrial furnaces. They are helpful not only in simplifying the automatic control of furnaces, but also in enhancing the efficiency of thermo-technical automation. The main predictive calculation for this purpose performed currently is based on the zone method by H.C. Hottel. Since this method has only a restricted application since the elementary gaseous zones (or surface zones) must be divided into the form of cubes (or into squares), it is necessary to introduce a new method for calculating the one-way direct exchange area by which the prediction for industrial furnaces can be used more widely and conveniently. With the replacement of cubic (or square) zones by rectangular zones, the induced formulas for calculating one-way direct exchange areas under eight different conditions are derived. Two types of induced formulas, which may be considered

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 33-44]

as representative of those under eight different conditions, are offered in this paper. In one case the direct exchange area lies between two gaseous zones. The induced formulas derived, determining the allowed values of exchange areas and providing for the equations of heat equilibrium, are applicable to the mathematical models of computers. The results computed are relatively precise. A group of equations of heat equilibrium in which all the divided zones in a furnace are involved may be solved simultaneously by a computer. Therefore, the space distribution of the temperature of gas and surface and that of the heat flux can be determined. Finally, the accuracy of results calculated by a computer is discussed and a ratio of length to width of divided zones of not more than 1.2 is proposed.

AUTHOR: WANG Kuihan [3769 7608 3352]  
CUI Chuanmeng [1508 0278 1322]

ORG: Both of the Metallurgy and Physical Chemistry Teaching and Research Group

TITLE: "On the Corrosion of Mo-MgO Ceramal Casing Tube under Continuous Measurement of the Temperature of Molten Steel"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 45-52

TEXT OF ENGLISH ABSTRACT: Mo-MgO ceramal casing tubes, useful for shielding thermocouples during continuous measurement of the temperature of molten steel, have been applied to such pilot-plants as converters, electric arc furnaces and ladles since they were first developed in 1974. It has been found that some Mo-MgO ceramal casing tubes differ from each other in their service life. In order to find out the corrosion mechanism and to prolong the service life of these casing tubes, several corrosion experiments were performed by analyzing the samples of Mo-MgO ceramal casing tubes of different lifetimes. Moreover, a physicochemical experiment was done for determining the corrosion effect of such factors as pigging, steel and slag with a crucible made from the same material as the Mo-MgO ceramal casing tube. The results of the experiments are as follows:

1. Corrosion resistance to steel or slag of Mo-MgO ceramal not only depends on its constituents, but also on its microstructure.

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 45-52]

2. With the shielding atmosphere of inert gas at a temperature of 1650°C, the ceramal is corroded by pigging, slag and steel in order of their corrosivity.
3. The miscibility between Fe and Mo is the dominant factor of metallic phase corrosion and the corrosion speed depends to a large extent on the diffusion rate of Fe in Mo-Fe solid solution, and the thinner the interlayer, the more quickly the ceramal corrodes.
4. The corrosion effect of Fe-C melt on Mo-MgO ceramal is intensified with the increase of carbon contents.
5. The corrosion effect of slag on Mo-MgO ceramal is mainly decided by the oxidizability of slag.

AUTHOR: YANG Zupan [2799 4371 4323]  
ZHAO Nairen [6392 0035 0088]

ORG: YANG of the Metallurgy and Physical Chemistry Teaching and Research Group; ZHAO of the Semiconductors Teaching and Research Group

TITLE: "An Expression of Basicity for Blast Furnace Slags Containing Titanium Oxide"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 53-58

TEXT OF ENGLISH ABSTRACT: In view of the fact that two slags are equal in CaO activity when they are equal in basicity, this paper gives an expression of basicity of the slags containing titanium oxide as

$$R = \frac{\%CaO}{\%SiO_2 + 0.61 \cdot \%TiO_2}$$

The expression has been determined by means of measuring the activity of CaO in TiO<sub>2</sub>-CaO-SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-MgO slags.

AUTHOR: ZHAN Qinglin [6124 1987 7207]  
JI Chunlin [0370 2502 7207]

ORG: Both of the Physics of Metals Teaching and Research Group

TITLE: "On the Kinetics of Reduction of  $\text{TiO}_2$  in Blast Furnace Slags by Graphite Carbon"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 59-65

TEXT OF ENGLISH ABSTRACT: The rate of reduction of  $\text{TiO}_2$  in  $\text{CaO-SiO}_2\text{-Al}_2\text{O}_3\text{-MgO-TiO}_2$  liquid slags is measured under such conditions that only  $\text{TiO}_2$  can be reduced by graphite carbon at a temperature of 1400~1530°C. The rate constant of reduction is calculated by

$$\lg K = - \frac{16.0 \times 10^3}{T} + 6.320$$

and the activation energy  $\Delta E = 73.1 \text{ kcal/mol}$ .

AUTHOR: YANG Hongcai [2799 3163 2088]  
ZUO Xiuzhong [1563 4423 1813]  
LIU Guolu [0491 0948 4389]

ORG: YANG of the Department of Metal Materials; ZUO and LIU both of the Department of Physics

TITLE: "Fe-Si System Alloys: Their Valence Electron Structures, Plasticity Mechanism and Magnetic Properties"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 67-77

TEXT OF ENGLISH ABSTRACT: This paper presents an analysis of the valence electron structures of several commercial Fe-Si system alloys based on the empirical electron theory first proposed by Professor S.H. Yu in 1978. Parameters of the valence electron distribution, such as number of covalent electrons, number of lattice electrons and pair number of bond covalent electrons, are calculated and tabulated. Magnetic moments of several Fe-Si alloys with different constitutions, calculated by using Professor Yu's theory, are quite consistent with the experimental results. It is observed that there exists a regularity between the change of chemical constitution and the hybridization transfer in these alloys. It seems that there is an inherent rule in Fe-Si alloys such that the number of lattice electrons presents abrupt changes when the Si content is equal to about 2.6 wt percent and 4.9 wt



[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 67-77]

percent respectively. This figure also shows that the curves of plasticity behavior (elongation  $\delta$  percent and area reduction  $\psi$  percent) and the curve of the number of lattice electrons ( $n_l$ ) resemble each other in shape, i.e., the plastic deformation is mainly caused by the effect of lattice electrons.

AUTHOR: YU Heji [5713 0735 3444]  
JIN Guodong [6855 0948 2767]  
SU He [5685 4421]

ORG: YU and SU both of the Theoretical Mechanics Teaching and Research Group;  
JIN of the Rock Fragmentation Teaching and Research Group

TITLE: "The Finite Element Method Used for Analyzing the Mechanism of Rock Breaking with a Wedged Cutter"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 78-88

TEXT OF ENGLISH ABSTRACT: This paper introduces the finite element method used for analyzing the contact stress acting on rock by a wedged cutter. In such a case the contact stress can be considered a structure consisting of both plane stress elements and truss elements. Its global stiffness matrix is expressed as

$$[K] = \sum_{e=1}^n [K^{(e)}] + \sum_{t=1}^m [K^{(t)}],$$

where  $[K_p^{(e)}]$  is the general stiffness matrix of plane stress elements and  $[K_t^{(e)}]$  is the stiffness matrix of the truss respectively, and the latter must be specially assigned. In this way several stress fields ( $\sigma_{\max}$ ,  $\sigma_{\min}$  and  $\sigma_{\max} - \sigma_{\min}$  before the suddenly lumpy breaking) in rock under pressure by a wedged cutter with a round

[Continuation of DONGBEI CONGXUEYUAN XUEBAO No 3, 1981 pp 78-88]

end are calculated and shown. The whole process of rock breaking is programmed in such a way that a method of load increments is applied since the indefinite load and the stress release are taken into account due to the non-elasticity of rock.

In conclusion,

1. Powdered kernels take form initially. With the sudden energy release due to the energy stored in the powdered kernels, the rock breaks into large lumps suddenly under tensile-cracking.
2. Tensile failure is the main cause and also the main form of this suddenly lumpy breaking.

AUTHOR: DING Yaowu [0002 5069 2976]  
CHI Hanzhong [6688 3352 1813]  
WANG Shixuan [3769 0013 6513]

ORG: DING of the Department of Machinery; CHI of the Department of Mathematics;  
WANG of the Shenyang Heavy-duty Instruments Plant

TITLE: "A New Analysis of the Strength and Stiffness of the Gyratory's Main Shaft"

SOURCE: Shenyang DONGBEI CONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 89-96

TEXT OF ENGLISH ABSTRACT: Based on analyzing the prevailing loading method for the gyratory's main shaft, a more practical way of loading is suggested in this paper. In general, the crushing force is calculated according to the power of the equipped motor, but such an assumed calculation is unreasonable. Here it is proposed that calculating the crushing force ought to be in accordance with the pressure measured from the hydraulic cylinder (as shown in the mechanics model). By means of the semi-analytical FEM, the three-dimensional strains and stresses at various points of a main shaft, e.g., those of a light type 1200 gyratory, are discussed and calculated by a computer. As a result, the strain of the main shaft, the normal stresses ( $\sigma_1$ ,  $\sigma_2$  and  $\sigma_\theta$ ) and the principal stresses ( $\sigma_1$ ,  $\sigma_2$  and  $\sigma_3$ ) on the 90° meridian section are shown. It is found that the stresses and

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 89-96]

various strains of the main shaft take place with maximum values in case of loading on its lower part and with minimum values in case of loading on its central part. This method, together with its results, may be useful in analyzing the strength and stiffness of the main shaft of a gyratory more precisely. In addition, this method is a valuable reference for designing other heavy-duty shafts.

AUTHOR: CHEN Baozhi [7115 1405 2535]  
GUAN Shaozong [7070 4801 1350]  
CHEN Rongce [7115 2837 4595]

ORG: All of the Ventilation Teaching and Research Group

TITLE: "On the Air Flow Structure of Forced Ventilation in Tunnels and Its Effect on Dust Removal"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 97-105

TEXT OF ENGLISH ABSTRACT: The space near a stope in a tunnel, beyond the end of the vent jet-flow, is, in general, considered to be a "stagnation zone" in which the ventilation seems to be ineffective, and the functional range of forced ventilation  $L_u$  is equal to the range of the jet-flow, or it may be expressed as

$$L_u = (4-5)\sqrt{S}$$

where  $S$  is the cross section area of a tunnel. But the expression does not conform to reality. The fact is that the dust concentration in the atmosphere, even if  $L_u$  is rather more than  $(4-5)\sqrt{S}$ , is still below the dust cleaning standard and no dust accumulation takes place. It is found by simulating tests and practical measurements that there exists what we call the secondary flow circulation beyond the range of vent jet-flow. The behavior of secondary flow circulation and its effect on dust

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 97-105]

removal were investigated in our research. The functional range of forced ventilation will be increased by as much as a half when the secondary flow circulation is appropriately used to remove the dust in the tunnel under certain productive conditions. The air output required from the duct exit  $Q_0$  can be calculated for using the secondary flow circulation to remove dust by existing ventilating devices. The calculating formulas are given as

$$Q_0 = (0.5 \sim 0.6) \cdot k_1 \cdot S$$

or

$$Q_0 = \frac{G}{k_2(C_2 - C_0)}$$

where  $k_1$ --coefficient due to the exhausted gas from pneumatic drills;

$k_2$ --equivalent coefficient, determined by experiments;

$G$ --dust due to drilling (mg/s);

$C_2$ --dust concentration within the secondary flow circulation;

$C_0$ --dust concentration at duct exit.

Choose the greater value resulting from the above-mentioned formulas for  $Q_0$ .

AUTHOR: YUAN Deyu [6678 1795 3768]

ORG: Natural Dialectics Teaching and Research Group

TITLE: "Form and Feature--An Exploration of Natural Science in Ancient China"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 107-114

TEXT OF ENGLISH ABSTRACT: As a dominant form of natural science in ancient China, empirically-based science has developed uninterruptedly for a long historical period. It is a main feature of the historical development of science and technology in ancient China. The heritage of such empirically-based science is undoubtedly precious, but several branches among this treasury have never been explored enough by means of theoretical science up to now. As a form of science, empirically-based science developed mainly by ancient craftsmen is, after all, not advanced. For the modernization of science and technology in China, we ought to critically inherit the tradition of ancient empirically-based science and, more importantly, to combine both the age-old tradition of craftsmen of ancient China and the magnificent scholar's tradition of great Chinese culture.

AUTHOR: LIANG Ningyuan [2733 1380 0337]

ORG: Metallurgy and Reaction Engineering Teaching and Research Group

TITLE: "On the Macrokinetics of Metallurgical Process"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 115-126

TEXT OF ENGLISH ABSTRACT: The macrokinetics of metallurgical processes plays an important part in metallurgical physicochemistry and serves as a link between engineering science (such as transport phenomena and physicochemistry) and metallurgical engineering. This is also an application of transport phenomena to metallurgical reactions and thus always plays an important role in metallurgical reaching engineering. This paper describes the significance of macrokinetics in metallurgical reaction engineering and gives a comprehensive review of the research done on the subject in recent years. The essential aspects of the study of macrokinetics are pointed out in detail and a survey of macrokinetics is made in the conclusion.

9717

CSO: 4009/76

Instrumentation Technology

AUTHOR: GENG Rui.cheng [5105 3843 2052]

ORG: None

TITLE: "Plasma Chemistry Gaseous Precipitation Equipment"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 9, Sep 81 p 22

ABSTRACT: The DD-500 plasma chemistry gaseous phase precipitation equipment jointly made by the Beijing Instrument Plant and the Research Institute of Machine Industry Automation of the First Ministry of Machine Building has gone through certification in Beijing, most recently. It can precipitate a thin film of specified composition on semiconductor surface under a low temperature condition. It is mainly used to precipitate silicon nitride film in the large scale integrated circuit purification process. The evenness of the film is less than 3 percent and the work process is found to repeat very well. Stainless steel is used for the gas pathway system and it is well sealed; therefore, it is corrosion resistant and will not contaminate. Operation for a prolonged period of time has proved the instrument to be reliable.

AUTHOR: YE Decheng [0673 1795 2052]

ORG: None

TITLE: "Precision Digital Voltmeter Testing Equipment"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 9, Sep 81 p 22

ABSTRACT: The Shanghai Electrical Meter Plant has made a highly precise potentiometer type digital voltmeter testing equipment. Actual application and inspection by related metrological departments have found its accuracy to reach 5/100,000. Its appearance has resolved the difficulty of testing in the process of mass production of digital voltmeters. When it is used with a precision voltage divider, it may also be used to measure high voltages of 0-1000 v.

AUTHOR: LIU Runjiu [0491 3387 0036]

ORG: None

TITLE: "New Type Temperature Actuator"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 9, Sep 81 p 22

ABSTRACT: Shenyang Research Institute of Instrument and Meter Technology has succeeded in making a new type highly sensitive variable temperature instrument. A diffusion silicon strain resistor is used as the temperature measuring component in a range of  $-20$  to  $+80^{\circ}\text{C}$ . In a range of every  $30^{\circ}\text{C}$  measured, its precision is  $\pm 0.2^{\circ}\text{C}$ ; for every  $50^{\circ}\text{C}$  measured, its precision is  $\pm 0.5^{\circ}\text{C}$ . Its general sensitivity is  $3-4$  millivolt/ $^{\circ}\text{C}$ . Its sensitivity may even be raised according to the need. It is equipped with direct reading electric meter to show the temperature. Compared with those made of metal resistors or thermal couples, its cost is lower and it is more adaptable.

6168

CSO: 4009/102



## Printing Technology

AUTHOR: None

ORG: None

TITLE: "Printing Science Symposium Held in Yantai"

SOURCE: Beijing YINSHUA JISHU [PRINTING TECHNOLOGY] in Chinese No 5, 1981 p 2

ABSTRACT: On 3-10 Sep the National Bureau of Publication called a printing science symposium in Yantai of Shandong Province. A total of 51 delegates representing provincial, municipal, and autonomous region bureaus of publication, research institutes of printing technology, and printing plants, as well as the National Science Committee, the China Printing Company, the China Printing Materials Company, and the Shanghai Publication and Printing Company attended. They learned the Central Communist Document No 14 (1981), exchanged experiences concerning scientific research and technological reform, and discussed policies and responsibilities of research work in printing science. The delegates agreed for a certain period of time in the future, the responsibilities are (1) To promote modernization emphasizing book and journal printing; (2) To strengthen research on equipment, materials, and work processes simultaneously; (3) To strengthen scientific research and technological reform; (4) To learn, digest, and absorb foreign research results in printing science. WANG Yitong [3769 4135 0681] spoke of his observation of the condition of the phototypesetting machine in Japan. In his concluding speech, SHI Yucai [0670 5148 2088] spoke of, among other things, the plan to publish a printing science bulletin and someone's proposal of establishing an agency for regular study of policies of printing technology.

AUTHOR: ZHOU Junyan [0719 0193 1484]

ORG: Beijing Municipal Research Institute of Printing Technology

TITLE: "Positively Carrying Out the Development Plan of Printing Technology"

SOURCE: Beijing YINSHUA JISHU [PRINTING TECHNOLOGY] in Chinese No 5, 81 pp 6-7

ABSTRACT: In view of China's large population and limited capital, modernization of printing technology cannot depend upon large scale importation of new technology, new materials, and new equipment. The existing industries must proceed with reasonable technological reform to reduce consumption, to improve quality, and to increase efficiency. The next important measure is to have a development plan. The author believes that the plan should involve full utilization of existing letterpress printing plants. Under the goal of improving the quality, efficiency, and productivity, the work of technological reform and pollution elimination to protect the environment should be developed. With the existing plants as the foundation, offset and color offset capability should be steadily developed. Special machines to print office and business forms and technical courses to improve and train printers should also be included in the plan. These and other viewpoints of the author with respect to improving printing technology in China are presented.

AUTHOR: A Pan [7093 0982]

ORG: None

TITLE: "The MDC-I Color Transmission Density Meter Certification Conference Held in Wenzhou"

SOURCE: Beijing YINSHUA JISHU [PRINTING TECHNOLOGY] in Chinese No 5, 81 p 12

ABSTRACT: The Wenzhou Automation Equipment Plant has successfully made the MDC-I color transmission density meter. This is an instrument extensively used in modern printing, motion picture, television, and photography to test the optical density of colors of light sensitive materials or dyes. In Mar 81, the Wenzhou Municipal Bureau of Machine Industry called a meeting to certify this instrument and delegates representing Chinese Academy of Metrological Science, the General Bureau of Machine Application of the First Ministry of Machine Building, the Department of Optics of Zhejiang University, and the Shenyang Research Institute of Printing Technology attended. The instrument was tested with the standard density gradient meter of the National Academy of Metrology and examined under various other conditions. The delegates agreed that this new product is accurate, good looking, and compact and all its technical indices meet the design requirements. The manufacturer was given approval to produce it in batches.

6168

CSO: 4009/101

## Prospecting Technology

AUTHOR: HU Hansheng [5170 3352 3932]

ORG: Ore Prospecting Division, Hunan Provincial Bureau of Geology

TITLE: "Collection of Experiences of Ore Prospecting Engineering in Hunan Province: A Brief History of Drilling Prospecting"

SOURCE: Beijing TANKUANG GONGCHENG [PROSPECTING ENGINEERING] in Chinese No 5, 20 Oct 81 pp 1-2

ABSTRACT: In 1952 the Ministry of Geology dispatched 2 prospecting teams composed of geological drilling prospecting specialists to come to Chaling and Shuikou Mountain to develop drilling prospecting work. This was the beginning of this technology in Hunan. In these 30 years 4.68 million m of drilling prospecting work has been completed in the province and reserves of 72 types of ores, including coal, iron, manganese, phosphorus, tungsten, mercury, lead, and zinc within the province of Hunan have been clarified. This technology has contributed a great deal to the search for underground treasures of Hunan and to the socialist construction of the fatherland. This paper describes briefly how the drilling prospecting technology was brought to the province, how the teams were organized, and how the drilling projects were managed, as well as difficulties which the teams had to overcome step by step and the progresses and accomplishments of these 30 years.

AUTHOR: HUANG Shadong [7806 4801 2767]

ORG: Ore Prospecting Division, Hunan Provincial Bureau of Geology

TITLE: "The Method and the Effect of Extending Diamond Drilling by the Bureau"

SOURCE: Beijing TANKUANG GONGCHENG [PROSPECTING ENGINEERING] in Chinese No 5, 20 Oct 81 pp 2-6

ABSTRACT: The Hunan Provincial Bureau of Geology began to adopt diamond drill bits in 1974. By 1980, the technology has undergone 3 stages of experimentation, extension, and stabilization. The bureau had, in 1980, 7 teams and 25 diamond drills. Two of these teams have basically implemented the technique and have accumulated 285,083 m (including the use of mixed drills), with an average efficiency of 375.7m. The objectives include prospecting for mercury, manganese, gold, copper, lead, zinc, tungsten, molybdenum, iron, and phosphorus. It has been preliminarily demonstrated that diamond drills are efficient, less steel consuming, fewer accidents, easier to be moved around, and resulting in shorter prospecting cycles. Just as the introduction of any other new technology, there have been many difficulties and problems. Chiefly, in the first 2-3 years, drill bits were found to be extremely easily damaged, lasting only 20-30m per bit. The efficiency of the diamond drill was found to be not very different from the large caliber drills. Some teams decided to give up because of the excessive cost of the drills. Methods adopted to overcome these difficulties are described. Problems of preventing slanting holes, plugging up leaks to protect the hole, further improving efficiency and reducing cost, etc. are still being studied.

Telecommunications

AUTHOR: CUI Zhengzao [1508 2973 0146]

ORG: None

TITLE: "Line Concentration in Digital Switching Systems"

SOURCE: Shanghai DIANKIN KUAIBAO [TELECOMMUNICATIONS INFORMATION] in Chinese No 7, Jul 81 pp 33-41

ABSTRACT: Line division of digital switching systems includes the 2 categories of space division concentration and time division concentration. After briefly introducing the characteristics of typical forms of both types, this paper proceeds to compare them from viewpoints of technology, economy, and adaptability for future development. Based upon the current status and future trend of development of various countries of the world, preliminary viewpoints concerning the form of line concentration of digital switching system of urban telephone facility are proposed.

6248

CSO: 4009/100

## Water Conservation

AUTHOR: None

ORG: Huang County Water Conservancy Office, Shandong Province

TITLE: "Main Methods of Effective Water Conservancy Installation Management and Improvement of Economic Results in Huang County, Shandong"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 9, 20 Sep 81 pp 4-8

ABSTRACT: This county of 531,000 persons, 60 percent of whose 611,000 mu of agricultural land is level, has an average annual rainfall of 630 mm, 70 percent of it in July-September, and has had to deal with the problem of spring drought, summer waterlogging and fall drought. The main water conservancy management measures adopted since the 1960's are summarized. In the late 1970's major safety efforts were made on installations, and some dams were made capable of withstanding rains of an intensity encountered an average of once in 300 or 500 years. Similar repairs were made on flood control installations. At the same time a major effort was made to improve technical management, and the systems of "specialized management" and "mass management" were both used. Unified water allocation was undertaken; measures included the use of well irrigation in plains areas and pumping of reservoir water into mountain regions, and movement of excess water from the eastern part of the county to the western part. In addition, careful studies were made of meteorological, hydrological and soil characteristics affecting the efficiency of irrigation. A major effort was made to see that irrigation ditches were matched to reservoir capacities, that drainage was matched to irrigation, and that ground leveling activities were undertaken where they were most beneficial.

AUTHOR: Bai Cailong [4101 1752 7685]

ORG: Jinghuiqu Management Office, Shaanxi

TITLE: "Jinghuiqu Institutes Scientific Management and Planned Water Use and Gradually Increases Irrigation Effectiveness"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 9, 20 Sep 81 pp 23-26, 8

ABSTRACT: The Jinghuiqu irrigation district, Shaanxi, is a semiarid region where water use efficiency is extremely important to agriculture. Careful surveys were made of irrigation quantities and timing for various crops and water availability, and a water allocation plan was drawn up on the basis of this information. Examples of the plan for certain organizations are provided. In order to increase irrigation efficiency, efforts were made to stagger crop schedules enough to spread out peak water demand, in addition to which unified management of all water sources was instituted. As a result, irrigated area has increased from 500,000 mu after Liberation to 1.355 million mu currently, per-mu grain yield has steadily been over 800 jin per mu, with 1979 figures as high as 1,056 jin per mu. In addition, water use efficiency increased from 0.43 to 0.53.



AUTHOR: Jing Yongtang [6855 3057 1016]

ORG: Scientific Research Institute of Water Conservancy and Hydroelectric Power

TITLE: "An Experimental Study of Water-Carrying Capacity of Tubular Downhill Culverts and their Downstream Energy Dissipation"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 9, 20 Sep 81 pp 48-57, inside back cover

ABSTRACT: Tubular culverts for downhill transport of irrigation water have many advantages over open square or stepped cross section culverts, and are coming to replace them in many irrigation areas of the world. Formulas for the water-carrying capacity of such tubular culverts are derived for cases in which the upper opening of the tube is not fully submerged in water and in which it is fully submerged. Experimental studies were conducted to determine the actual flow characteristics of such tubes with different parameters; the results are presented in tables and graphs. In addition, a variety of designs for structures intended to dissipate the energy of the water at the lower exit of the tube were tested, and their characteristics are presented. The recommended design has a flow dividing fin at the lower outlet of the tube, followed by a barrier wall in the shape of a rounded W to dissipate the water flow energy.

8480

CSO: 4009/105

## Water Conservation

AUTHOR: CHEN Qinglian [7115 3237 3425]

ORG: Academy of Planning and Designing, Ministry of Water Conservation

TITLE: "Method of Sharing the Investment Cost of Water Conservation Construction of a Comprehensive Utilization Characteristic"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 10, 20 Oct 81 pp 1-6

ABSTRACT: Water conservation construction is generally of a comprehensive utilization characteristic. Aside from flood prevention, irrigation, power generation, navigation, water supply, fishery, and tourism, many other departments of the national economy also reap benefits from the project. In the past, the capital was always appropriated from the national treasury and as compensation for investment was not required, the benefited departments bore no economic responsibility whatsoever. Each department tried to bring as much benefit as possible without ever considering the economical reasonableness. Under the influence of the ultra-leftist ideology, for a long time, politics count, economics does not. Following the discussion of the shortcomings of the old system of funding water conservancy projects, the author proceeds to propose the following methods of sharing the cost: (1) Proportional distribution of cost according to the yearly benefit received by the various departments; (2) Proportional distribution of cost according to the cost of

[continuation of SHUILI SHUIDIAN JISHU No 10, 1981 pp 1-6]

of equivalent project otherwise required by each of the benefited departments; (3) Prorated distribution according to certain indices, such as water usage or reservoir capacity; (4) Dividing the investment capital among all major departments to be benefited; (5) The separable costs-remaining benefits method, i.e. the SCRB method of sharing recommended by the USA; (6) Dividing the investment cost among various regions. Under each of the above methods, the technique of computation is introduced.



AUTHOR: XU Da [1776 6671]

ORG: Research Academy of Water Conservancy and Hydroelectric Power Science

TITLE: "National Symposium of Subterranean Drainage and Irrigation Technology for Farm lands and the Technique of Improving the Saline and Alkaline Lands of Yanbei Prefecture"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 10, 20 Oct 81 p 45

ABSTRACT: The Chinese Water Conservancy Society Farm Land Water Conservancy Specialty Committee and the Shanxi Provincial Water Conservancy Society jointly called the symposium in Datong City of Shanxi Province from 26 Aug to 1 Sep. There were 183 delegates attending and more than 70 papers were received. The subterranean drainage of farm land technique is reported to have been preliminarily extended in the 2 provinces of Jiangsu and Zhejiang, and experiments are being conducted in many other cities and provinces. According to incomplete statistics, construction for the technique has been completed for close to 5 million mu of fields. Subterranean pipes have also been laid in 3 million mu of fields for irrigation. It is hoped that reliable data will soon be available concerning the benefits of these techniques. Yanbei Prefecture of the Datong basin has rich ground water resources, but the soils have a high soda content and the yield is low and unstable. There remain 700 thousand mu of uncultivated wasteland. It is essential to replace the

[continuation of SHUILI SHUIDIAN JISHU No 10, 1981 p 45]

existing simple grain production system with a combined farming, forestry, and animal husbandry structure. Water conservancy measures, using open ditches, subterranean pipes, and wells to drain the fields and to utilize the ground water resources, are proposed. Unified leadership is considered important for coordinating all related departments and scientific and technological manpower to provide unified management for surface and ground water, for water distribution and control, and for irrigation and drainage.

6248

CSO: 4009/106

## Water Conservation

AUTHOR: CHEN Qinglian [7115 3237 7425]

ORG: Academy of Planning and Designing, Ministry of Water Conservation

TITLE: "Method of Sharing the Investment Cost of Water Conservation Construction of a Comprehensive Utilization Characteristic"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 10, 20 Oct 81 pp 1-6

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[continuation of SHUILI SHUIDIAN JISHU No 10, 1981 pp 1-6]

of equivalent project otherwise required by each of the benefited departments; (3) Prorated distribution according to certain indices, such as water usage or reservoir capacity; (4) Dividing the investment capital among all major departments to be benefited; (5) The separable costs-remaining benefits method, i.e. the SCRB method of sharing recommended by the USA; (6) Dividing the investment cost among various regions. Under each of the above methods, the technique of computation is introduced.

AUTHOR: XU Da [1776 6671]

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ABSTRACT: The Chinese Water Conservancy Society Farm Land Water Conservancy Specialty Committee and the Shanxi Provincial Water Conservancy Society jointly called the symposium in Datong City of Shanxi Province from 26 Aug to 1 Sep. There were 183 delegates attending and more than 70 papers were received. The subterranean drainage of farm land technique is reported to have been preliminarily extended in the 2 provinces of Jiangsu and Zhejiang, and experiments are being conducted in many other cities and provinces. According to incomplete statistics, construction for the technique has been completed for close to 5 million mu of fields. Subterranean pipes have also been laid in 3 million mu of fields for irrigation. It is hoped that reliable data will soon be available concerning the benefits of these techniques. Yanbei Prefecture of the Datong basin has rich ground water resources, but the soils have a high soda content and the yield is low and unstable. There remain 700 thousand mu of uncultivated wasteland. It is essential to replace the

[continuation of SHUILI SHUIDIAN JISHU No 10, 1981 p 45]

existing simple grain production system with a combined farming, forestry, and animal husbandry structure. Water conservancy measures, using open ditches, subterranean pipes, and wells to drain the fields and to utilize the ground water resources, are proposed. Unified leadership is considered important for coordinating all related departments and scientific and technological manpower to provide unified management for surface and ground water, for water distribution and control, and for irrigation and drainage.

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CSO: 4009/106

## Water Power

AUTHOR: WANG Fengyin [3769 7685 7892]

ORG: Huanglongtan Hydropower Plant

TITLE: "Analysis of the Causes of the Flooding Accident of the Powerhouse of the Huanglongtan Hydroelectric Power Station"

SOURCE: Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 5, 12 May p 3

ABSTRACT: The powerhouse of the Huanglongtan Hydroelectric Power Station situated in the northwestern mountain regions of Hubei Province was flooded at 0521 hours on 24 June 1980, causing a 9-hour power failure. Analysis blamed poor design, the inappropriate location of the site of the powerhouse and the lack of drainage and flood prevention measures. The power station was also not prepared in flood forecasting and flood prevention. Communications between the power station and meteorological and hydrological reporting stations relied solely on one telephone line. When the station was flooded, all communication links and power were cut off, and there was no emergency electrical power source. Without electricity, the sluice gates could not be operated. Design flaws in flood prevention were the main cause of the flooding accident at the Huanglongtan Hydroelectric Power Station.

AUTHOR: ZENG Pengjui [2582 7720 0036]

ORG: First Prospecting Team of the Northeast Surveying and Design Institute of the Ministry of Electric Power

TITLE: "Some Experience in Diamond Drilling"

SOURCE: Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 5, 12 May 81 p 17

ABSTRACT: Between December of 1979 and May of 1980, two diamond drills were used at the Datengxia prospecting site to drill 3,247 meters. They proved to be more efficient than steel drills. The diamond drills were especially suitable for drilling and extracting the soft mud band layer because they extracted 339 layers of mud bands ranging in thickness from 2 millimeters to 30 millimeters during the first half of 1980. This could not be done by steel drills. The drill heads of the diamond drill should be carefully selected. The drill head manufactured in Shanghai had 8 water spouts for cooling the drill head and washing away rock powder. Its useful life was twice that of the drill head with only 6 water spouts manufactured in Guilin. When drilling in fragmented rock formation and hard rock formation, abnormal wear increased. Two methods to protect the walls of the hole drilled were devised. One was to lower a casing pipe, the other was to seal the hole with cement of a water and lime ratio of 50 percent. Drilling in hard granules of quartz sandstone was difficult, but it was accomplished by drilling through the hard layer with a new diamond drill head.



AUTHOR: LIN Xiaonan [2651 5135 3948]

ORG: Fuchunjiang Hydroelectric Powerplant

TITLE: "Determining the Goal and Function of Comprehensive Automation of the Fuchunjiang Hydroelectric Power Station"

SOURCE: Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 5, 12 May 81 p 42

ABSTRACT: Fuchunjiang Hydroelectric Power Station is a low waterhead runoff type power station with a reservoir capacity of 440 million cubic meters, 5 generators and a total installed capacity of 300,000 kilowatts. In computer applications at the hydroelectric power station, flood forecasting and operations control are important functions. Another assurance of the safe operation of the reservoir and station is timeliness and reliability of flooding reports of the reservoir area. In the past, such reports relied on telegraphic messages. During the flooding season, the runoff type power station generates electricity according to the amount of water flow, forcing the generators to simultaneously operate under full loads. To assure safe operation, it is hoped that computers can help perform tasks which humans cannot perform accurately, mainly prediction of mishaps, carefully monitoring relays, automatic equipment and switches. Analysis shows the use of a distributed system of computer stations to realize comprehensive automation of the whole powerplant can produce economic benefits with better efficiency and safer operation.

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